

Text S1.**PRISMA NMA Checklist of Items to Include When Reporting A Systematic Review Involving a Network Meta-analysis**

Section/Topic	Item #	Checklist Item	Reported on Page #
TITLE			
Title	1	Identify the report as a systematic review <i>incorporating a network meta-analysis (or related form of meta-analysis)</i> .	1
ABSTRACT			
Structured summary	2	<p>Provide a structured summary including, as applicable:</p> <p>Background: main objectives</p> <p>Methods: data sources; study eligibility criteria, participants, and interventions; study appraisal; and <i>synthesis methods, such as network meta-analysis</i>.</p> <p>Results: number of studies and participants identified; summary estimates with corresponding confidence/credible intervals; <i>treatment rankings may also be discussed. Authors may choose to summarize pairwise comparisons against a chosen treatment included in their analyses for brevity.</i></p> <p>Discussion/Conclusions: limitations; conclusions and implications of findings.</p> <p>Other: primary source of funding; systematic review registration number with registry name.</p>	5,6
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known, <i>including mention of why a network meta-analysis has been conducted.</i>	7,8
Objectives	4	Provide an explicit statement of questions being addressed, with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	8
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists and if and where it can be accessed (e.g., Web address); and, if available, provide registration information, including registration number.	8,9

Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. <i>Clearly describe eligible treatments included in the treatment network, and note whether any have been clustered or merged into the same node (with justification).</i>	9,10
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	9
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	9,10,Figure1, Additional file 1: Text S2
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	9,10
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	10
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	11
Geometry of the network	S1	Describe methods used to explore the geometry of the treatment network under study and potential biases related to it. This should include how the evidence base has been graphically summarized for presentation, and what characteristics were compiled and used to describe the evidence base to readers.	11
Risk of bias within individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	11,12
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means). <i>Also describe the use of additional summary measures assessed, such as treatment rankings and surface under the cumulative ranking curve (SUCRA) values, as well as modified approaches used to present summary findings from meta-analyses.</i>	11,12
Planned methods of analysis	14	Describe the methods of handling data and combining results of studies for each network meta-analysis. This should include, but not be limited to: <ul style="list-style-type: none"> • <i>Handling of multi-arm trials;</i> • <i>Selection of variance structure;</i> • <i>Selection of prior distributions in Bayesian analyses; and</i> 	11,12

		<ul style="list-style-type: none"> • <i>Assessment of model fit.</i> 	
Assessment of Inconsistency	S2	Describe the statistical methods used to evaluate the agreement of direct and indirect evidence in the treatment network(s) studied. Describe efforts taken to address its presence when found.	10,11,12
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	10,11,12
Additional analyses	16	<p>Describe methods of additional analyses if done, indicating which were pre-specified. This may include, but not be limited to, the following:</p> <ul style="list-style-type: none"> • Sensitivity or subgroup analyses; • Meta-regression analyses; • <i>Alternative formulations of the treatment network; and</i> • <i>Use of alternative prior distributions for Bayesian analyses (if applicable)._</i> 	11,12

RESULTS†

Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12
Presentation of network structure	S3	Provide a network graph of the included studies to enable visualization of the geometry of the treatment network.	12,13,Figure2-3
Summary of network geometry	S4	Provide a brief overview of characteristics of the treatment network. This may include commentary on the abundance of trials and randomized patients for the different interventions and pairwise comparisons in the network, gaps of evidence in the treatment network, and potential biases reflected by the network structure.	12,13,
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	12, Table1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment.	

Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: 1) simple summary data for each intervention group, and 2) effect estimates and confidence intervals. <i>Modified approaches may be needed to deal with information from larger networks.</i>	12,13, Figure2-5
Synthesis of results	21	Present results of each meta-analysis done, including confidence/credible intervals. <i>In larger networks, authors may focus on comparisons versus a particular comparator (e.g. placebo or standard care), with full findings presented in an appendix. League tables and forest plots may be considered to summarize pairwise comparisons.</i> If additional summary measures were explored (such as treatment rankings), these should also be presented.	12,13,Figure4-5, Additional file 1: Table S1-S13
Exploration for inconsistency	S5	Describe results from investigations of inconsistency. This may include such information as measures of model fit to compare consistency and inconsistency models, P values from statistical tests, or summary of inconsistency estimates from different parts of the treatment network.	12,13
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies for the evidence base being studied.	12,13, Additional file 1: Figure S1-S2
Results of additional analyses	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression analyses, <i>alternative network geometries studied, alternative choice of prior distributions for Bayesian analyses</i> , and so forth).	12,13
DISCUSSION			
Summary of evidence	24	Summarize the main findings, including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy-makers).	14-16
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias). <i>Comment on the validity of the assumptions, such as transitivity and consistency. Comment on any concerns regarding network geometry (e.g., avoidance of certain comparisons).</i>	16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	17
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. This should also include information regarding whether funding has been received from manufacturers of treatments in the network and/or whether some of the	17

authors are content experts with professional conflicts of interest that could affect use of treatments in the network.

PICOS = population, intervention, comparators, outcomes, study design.

* Text in italics indicateS wording specific to reporting of network meta-analyses that has been added to guidance from the PRISMA statement.

† Authors may wish to plan for use of appendices to present all relevant information in full detail for items in this section.

Text S2.

Search strategy:

Pubmed (1950-present)

1. ("TACE" OR "transarterial chemoembolization")
2. ("RFA" OR "radiofrequency ablation" OR "RF ablation" OR "radiofrequency thermal ablation" OR "RTA")
3. (PEI OR "ethanol injection" OR "ethanol ablation" OR "alcohol ablation")
4. ("microwave ablation" OR "microwave thermal ablation" OR MWA)
5. (liver OR hepato*)
6. (neoplas* OR cancer OR tumor OR tumour OR carcinoma OR oncolog*)
7. 1 OR 2 OR 3 OR 4
8. 5 AND 6 AND 7
9. "Ablation Techniques"[Mesh]
10. "Embolization"[Mesh]
11. "Liver Neoplasms"[Mesh]
12. 9 OR 10
13. 12 AND 11
14. 8 OR 13
15. (resection OR surgery OR hepatectomy)
16. (ablation OR injection OR embolization)
17. 5 AND 6 AND 15 AND 16
18. "Hepatectomy"[Mesh]
19. 12 AND 18 AND 11
20. 17 OR 19

21. 14 OR 20

Embase(1980-present)

1. 'TACE':ab,ti
2. 'transarterial chemoembolization':ab,ti
3. 1 OR 2
4. 'rfa':ab,ti
5. 'radiofrequency ablation':ab,ti
6. 'rf ablation':ab,ti
7. 'radiofrequency thermal ablation':ab,ti
8. 'rta':ab,ti
9. 4 OR 5 OR 6 OR 7 OR 8
10. 'PEI':ab,ti
11. 'ethanol injection ':ab,ti
12. 'ethanol ablation ':ab,ti
13. 'alcohol ablation ':ab,ti
14. 10 OR 11 OR 12 OR 13
15. 'microwave ablation ':ab,ti
16. 'microwave thermal ablation ':ab,ti
17. 'MWA ':ab,ti
18. 15 OR 16 OR 17
19. 'liver':ab,ti
20. 'hepato*':ab,ti
21. 19 OR 20
22. 'neoplas*':ab,ti
23. 'cancer ':ab,ti
24. 'tumor ':ab,ti
25. 'tumour ':ab,ti
26. 'carcinoma ':ab,ti
27. 'oncolog*':ab,ti

28. 22 OR 23 OR 24 OR 25 OR 26 OR 27
29. 3 OR 9 OR 14 OR 18
30. 21 AND 28 AND 29
31. ' resection':ab,ti
32. ' surgery':ab,ti
33. ' hepatectomy':ab,ti
34. 31 OR 32 OR 33
35. ' ablation':ab,ti
36. ' injection':ab,ti
37. ' embolization':ab,ti
38. 35 OR 36 OR 37
39. 34 AND 38 AND 21 AND 28
40. 30 OR 39

Scoups

1. TITLE-ABS-KEY ("TACE")
2. TITLE-ABS-KEY ("transarterial chemoembolization")
3. 1 OR 2
4. TITLE-ABS-KEY ("RFA")
5. TITLE-ABS-KEY ("radiofrequency ablation")
6. TITLE-ABS-KEY ("RF ablation")
7. TITLE-ABS-KEY ("radiofrequency thermal ablation")
8. TITLE-ABS-KEY ("RTA")
9. 4 OR 5 OR 6 OR 7 OR8
10. TITLE-ABS-KEY ("PEI")
11. TITLE-ABS-KEY ("ethanol injection")
12. TITLE-ABS-KEY ("ethanol ablation")
13. TITLE-ABS-KEY ("alcohol ablation")
14. 10 OR 11 OR 12 OR 13
15. TITLE-ABS-KEY ("microwave ablation")

16. TITLE-ABS-KEY ("microwave thermal ablation")
17. TITLE-ABS-KEY ("MWA")
18. 15 OR 16 OR 17
19. TITLE-ABS-KEY ("liver")
20. TITLE-ABS-KEY ("hepato*")
21. 19 OR 20
22. TITLE-ABS-KEY ("neoplas*")
23. TITLE-ABS-KEY ("cancer")
24. TITLE-ABS-KEY ("tumor")
25. TITLE-ABS-KEY ("tumour")
26. TITLE-ABS-KEY ("carcinoma")
27. TITLE-ABS-KEY ("oncolog*")
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36. TITLE-ABS-KEY ("injection")
37. TITLE-ABS-KEY ("embolization")
38. 35 OR 36 OR 37
39. 34 AND 38 AND 21 AND 28
40. 30 OR 39

Web of science

1. TS=(ablation)
2. TS=(embolization)
3. 1 OR 2

4. TS=(hepatectomy)
5. TS=(liver neoplasms)
6. 3 AND 4 AND 5
7. TI=(resection)
8. TI=(surgery)
9. TI=(hepatectomy)
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11. TI=(ablation)
12. TI=(injection)
13. TI=(embolization)
14. 11 OR 12 OR 13
15. TI=(liver)
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17. 15 OR 16
18. TI=(neoplas*)
19. TI=(cancer)
20. TI=(tumor)
21. TI=(tumour)
22. TI=(carcinoma)
23. TI=(oncolog*)
24. 18 OR 19 OR 20 OR 21 OR 22 OR 23
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26. 3 AND 5
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28. TI=("transarterial chemoembolization")
29. 27 OR 28
30. TI=(RFA)
31. TI=("radiofrequency ablation")
32. TI=("RF ablation")
33. TI=("radiofrequency thermal ablation")
34. TI=(RTA)

35. 30 OR 31 OR 32 OR 33 OR 34
 36. TI=(PEI)
 37. TI=("ethanol injection")
 38. TI=("ethanol ablation")
 39. TI=("alcohol ablation")
 40. 36 OR 37 OR 38 OR 39
 41. TI=("microwave ablation")
 42. TI=("microwave thermal ablation")
 43. TI=(MWA)
 44. 41 OR 42 OR 43
 45. 29 OR 35 OR 40 OR 44
 46. 46 AND 17 AND 24
 47. 6 OR 25 OR 26 OR 46

Table S1.
Summary of the studies included in the network meta-analysis.

Study Year	Design style	Countr /	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
<u>Zhang</u> 2002 ²³	Prospectiv e cohort	China	HCC	0.3-2	RFA	15(15)	13/2	61.8 (38-78)	4.1 (2.4-6.0)	NA	0.80(1y)	0.80(1y)	NA
					TR	15(15)	12/3	57.8 (39-72)	4.6 (2.3-7.1)	NA	1.00(1y)	1.00 (1y)	NA
<u>Lencioni</u> 2003 ²⁴	RCT	Italy	HCC	1.9±0.8	RFA	52(69)	36/16	67±6 (52-78)	2.8±0.6	1.00(1y)	NA	1.00(1y)	15 pain and 10 fever
					PEI	50(73)	30/20	69±7.4 (40-82)	2.8±0.8	0.96(1y)	NA	0.96(1y)	13 pain and 5 fever
<u>Lin</u> 2004 ²⁵	RCT	China	HCC	2±0.9	RFA	52(69)	35/17	62±11	2.9±0.8	0.76(3y)	NA	0.35(3y)	1 transient pleural effusion

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
<u>Vivarelli</u> 2004 ²⁶	Retrospective cohort	Italy	HCC	2.4	RES	79(92)	57/22 (43-81)	65.2±8.2 (21/58)	≤3/3.1-5 (21/58)	0.66(3y)	NA	0.17(3y)	1 pain
										RFA	79(112)	67/12 (41-88)	67.8±8.7 (22/57)
<u>Cho</u> 2005 ²⁷	Retrospective cohort	Korea	HCC	0.1-3	RES	61	48/13	57	3.4±1.0	NA	0.77(3y)	0.77(3y)	2 bleeding, 1 intraabdominal abscess, 1 wound infection
										RFA	99	76/23	58
<u>Huang</u> 2005 ²⁹	RCT	China	HCC	1-4.9	RES	38(42)	27/11	59±11.4 (24/14)	≤2/2.1-3 (24/14)	0.82	NA	0.82	NA
										PEI	38(46)	19/19	63±10.9 (21/17)
<u>Hong</u> 2005 ²⁸	Retrospective cohort	Korea	HCC	2.9(0.4-4. 6)	RES	93	69/24	49.2±9.9 59.1±9.6	2.5±0.8 2.4±0.6	0.84(3y) 0.73(3y)	NA	0.84(3y) 0.73(3y)	NA
										RFA	55	41/14	59.1±9.6
<u>Lin</u> 2005 ³⁰	RCT	China	HCC	2.3±1	RFA	62(78)	40/22	61±10 60±8	2.5±1 2.3±0.8	0.74(3y) 0.60(3y)	NA	0.74(3y) 0.60(3y)	2 haemothorax, 1 gastric bleeding and perforation 1 pain
										PEI	62(76)	39/23	60±8
<u>Lu</u> 2005 ³¹	Retrospective cohort	China	HCC	2.1±1.1	RFA	53(72)	43/10 (24-74)	54.5±11.7 (1.0-6.1)	2.6±1.2 (1.0-6.1)	0.38(3y)	NA	0.38(3y)	2 skin burn, 1 puncture wound infection
										MWA	49(98)	44/5	50.1±13.7 (24-74)

Study	Design	Country	Disease	Follow-up	Treatment	Group n	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Montorsi 2005 ³²	Prospective cohort	Italy	HCC	2.1	RES	40	33/7	67±9	<5cm	NA	NA	0.73(3y)	NA
						RFA	58	43/15	67±6	NA	NA	0.60(3y)	NA
Shiina 2005 ³³	RCT	Japan	HCC	3.1(0.6-4.3)	RFA	118(184)	79/39	≤65/≥65 (44/74)	≤2/≥2 (45/73)	NA	NA	0.61(3y)	1 transient jaundice, 1 skin burn, 1 hepatic infarction, 3 neoplastic seeding
						PEI	114(188)	87/27	≤65/≥65 (41/73)	≤2/≥2 (57/57)	NA	NA	0.45(3y)
Chen 2006 ³⁴	RCT	China	HCC	2.4±1	RES	90	75/15	49.4±10.9 (42/48)	≤3/3.1-5	0.53	NA	0.53	2 liver failure, 2 gastrointestinal bleeding, 27 ascites
						RFA	71	56/15	51.9±11.2 (37/34)	≤3/3.1-5	0.58	NA	0.58
Lu 2006 ³⁵	RCT	China	Early HCC	1.8	RES	54(56)	37/17	49±14	3.2±1.0	NA	NA	0.86 (3y)	3 wound infection, 1 gastrointestinal bleeding
						RFA	51(57)	42/9	55±13	2.7±1.0	NA	NA	0.87 (3y)
Cho 2007 ³⁶	Retrospective cohort	Korea	HCC	5.7	RES	130(145)	103/27	56.3±8.8 (43/87)	≤2/2.1-3	0.66	NA	0.66	NA
						PEI	249(275)	181/68	57.7±9.7 (169/80)	≤2/2.1-3	0.49	NA	0.49
Gao 2007 ³⁷	Retrospective cohort	China	HCC	4.6	RES	34(37)	28/6	51.5 (38-67)	2.58±0.41	0.76	NA	0.76	12 fever, 5 ascites
						RFA	53(84)	41/12	57.1 (31-81)	2.45±0.37	0.62	NA	0.62
Lupo 2007 ³⁸	Retrospective cohort	Italy	HCC	2.6	RES	42	33/9	67(28-80)	4.0(3-5)	NA	0.43	0.43	2 urine infection, 1 bilioma, 1 pleural effusion, 1 renal failure, 1 intra-abdominal bleeding

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Zhou ³⁹	Retrospective cohort	China	HCC	0.5-5.9	RES	40(42)	35/5	53±13	≤2/2.1-5 (7/33)	NA	0.32	0.32	2 liver failure, 1 hepatic abscess, 2 pleural effusion, 1 cutaneous metastasis
Abu-Hilal ⁴⁰	Retrospective cohort	Italy and China	Early HCC	3.6	RES	34	26/8	67	3.8(1.3-5) (8/39)	NA	0.56	0.56	3 hepatic failure 1 artero-portal fistula
Brunello ⁴¹	RCT	Italy	Early HCC	2.2	RFA	70(89)	49/20	70.3±8.1	1.27±0.54	0.60(3y)	NA	0.60(3y)	1 haemoperitoneum 1 right haemothorax 1 haemoperitoneum 1 death
Guglielmi ⁴²	Retrospective cohort	Italy	HCC	2.3	RES	91(113)	73/18	≤65/>65 (47/44)	≤3/3.1-6 (31/60)	0.55	0.43	0.48	33 postoperative complications 11 postoperative complications
Hiraoka ⁴³	Retrospective cohort	Japan	HCC	2.5	RES	59	44/15	62.4±10.6	2.27±0.55	0.59	NA	0.59	1 death, 2 abscess 1 biloma, 2 dermatitis
Bu 2009 ⁴⁹	Retrospective cohort	China	HCC	2.9(0.5-6)	RES	42(46)	36/6	53.93±10.74	≤3/3.1-5 (14/28)	0.57	0.46	0.50	1 postoperative hemorrhage, 3 pleural effusions, 2 subdiaphragmatic effusion

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
					RFA	46(54)	40/6	55.89±7.37	≤3/3.1-5 (20/26)	0.50	0.31	0.37	4 pleural effusions, 1 postoperative hemorrhage, 1 skin burn
Ohmoto 2009 ⁴⁴	Retrospective cohort	Japan	HCC	2.8±2	RFA	34(37)	25/9	67 (44-78)	1.6 (0.7-2.0)	0.71	NA	0.71	2 pain, 4 fever, 1 bile duct injury, 1 pleural effusion, 1 skin burns, 1 vagovagal reflex
					MWA	49(56)	41/8	64 (38-75)	1.7 (0.8-2.0)	0.37	NA	0.37	11 pain, 17 fever, 9 bile duct injury, 8 pleural effusion, 5 ascites, 4 skin burns, 2 vagovagal reflex, 2 abscess, 2 intraperitoneal bleeding, 1 hepatic infarction, 1 portal thrombus, 1 biliary peritonitis
Sakaguchi 2009 ⁴⁵	Retrospective cohort	Japan	HCC	0.1-5	Laparoscopic RFA	249	169/80	65.6±8.9	2.48±0.89	0.57	NA	0.57	1 frequent premature ventricular contractions, 1 liver decompensation
					Laparoscopic RFA	142	107/35	64.9±7.8	2.28±0.74	0.63	NA	0.63	1 breath holding and incomplete intestinal obstruction, 2 liver decompensation
Santambrogio 2009 ⁴⁶	Prospective cohort	Italy	HCC	3.2	RES	78	55/23	68±8	2.87±1.21	0.54	NA	0.54	15 extra-hepatic complications

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
					Laparoscopic RFA	74	59/15	68±7	2.63±1.07	0.41	NA	0.41	14 extra-hepatic complications
<u>Shibata</u> 2009 ⁴⁷	RCT	Japan	HCC	2.5±1.2	RFA	43(44)	33/10	69.8±8 (44-87)	1.6±0.5 (0.8-2.6)	0.84(3y)	NA	0.84(3y)	1 pseudoaneurysm
Ueno 2009 ⁴⁸	Retrospective cohort	Japan	HCC	3(0.3-7.9)	RES	123(136)	82/41	67(28-85)	2.7±0.1	0.81	0.72	0.80	NA
					RFA	155(209)	100/55	66(40-79)	2.0±0.1	0.38	0.78	0.63	NA
<u>Guo</u> 2010 ⁵⁰	Retrospective cohort	China	HCC	2.5	RES	73(155)	57/16	50.0 (17.0-68.0)	≤3/3.1-5 (30/43)	0.27	0.47	0.44	1 postoperative hemorrhage, 5 abscess, 3 infected ascites, 1 liver failure, 4 pleural effusion
					RFA	86(211)	63/23	52.5 (26.0-80.0)	≤3/3.1-5 (42/44)	0.33	0.16	0.21	1 postoperative hemorrhage, 1 bile leak, 1 abscess, 1 infected ascites, 3 pleural effusion
<u>Huang</u> 2010 ⁵¹	RCT	China	HCC	3.87	RES	115(144)	85/30	55.91±12.68 (45/44)	≤3/3.1-5	0.82	0.73	0.76	1 hepatic failure, 13 ascites, 5 effusion, 9 bile leakage, 2 postoperative bleeding, 2 gastrointestinal bleeding
					RFA	115(147)	79/36	56.57±14.30 (57/27)	≤3/3.1-5	0.61	0.52	0.55	1 gastric perforation, 2 hemorrhage, 1 malignant seeding, 1 hepatic infarction
<u>Kagawa</u> 2010 ⁵²	Retrospective cohort	Japan	Early HCC	4.2	RES	55(69)	40/15	66.1±8.4 (9/46)	≤2/2.1-5	0.42	NA	0.42	2 deaths, 1 liver failure, 1 pleural effusion, 1 pneumonia, 2 biliary leakage

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
<u>Morimoto</u> 2010 ⁵³	RCT	Japan	HCC	2.7	RFA	18(25)	12/6	73 (48-84)	3.7±0.6	NA	0.78(3y)	0.78(3y)	5 pain, 2 pleural effusion
						TR	62(79)	39/23	≤2/2.1-5 (19/43)	0.29	NA	0.29	1 duodenal perforation, 1 hemothorax
<u>Azab</u> 54	RCT	Egypt	HCC	1.5	RFA	19(21)	15/4	70 (57-78)	3.6±0.7	NA	0.95(3y)	0.95(3y)	1 pain, 1 pleural effusion
						30(33)	75/15	46-77	<5cm	NA	NA	0.90	5 superficial burn, 17 transient pain, 3 portal vein thrombosis, 7 fever, 1 ascites
<u>Giorgio</u> 2011 ⁵⁵	RCT	Italy	HCC	1.8	RFA	142	105/37	70±2 (68-74)	2.34±0.45 (1.1-3)	0.70	NA	0.83	2 portal vein thrombosis, 3 fever, 3 ascites
						PEI	143	102/41	72±6 (68-79)	2.27±0.48 (1.3-2.9)	0.68	NA	0.68
<u>Hung</u> 56	Retrospective cohort	China	Early HCC	3.5±2	RES	229	184/45	60.07±12.56	2.88±1.06	0.77	NA	0.77	NA
						RFA	190	121/69	67.42±1.45	2.37±0.92	0.67	NA	0.67
<u>Nishikawa</u> 2011 ⁵⁷	Retrospective cohort	Japan	HCC	3.3	RES	69	50/19	67.4±9.7	2.68±0.49	0.74	NA	0.74	2 bile leakage, 2 ascites, 1 acute respiratory distress syndrome, 1 gastrointestinal bleeding
						RFA	162	95/67	68.4±8.7	1.99±0.62	0.63	NA	0.63
<u>Yun</u> 2011 ⁵⁸	Retrospective	Korea	HCC	3.5(0.1-9.	RES	215	171/44	51.7±9.7	2.1±0.5	0.94	NA	0.94	NA

Study Year	Design style	Country '	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
				1)	RFA	255	197/58	57.0±9.9	2.1±0.5	0.87	NA	0.87	NA
Zhang ⁵⁹	Retrospect ive cohort	China	HCC	0.5-3.5	RES	103(117)	78/25	56.4±15.2	<5cm	NA	NA	0.35(3y)	12 wound infection, 5 postoperative hemorrhage, 2 hepatic failure, 15 pleural effusions, 6 pleural effusions
					RFA	85(106)	62/23	58.5±12.9	<5cm	NA	NA	0.39(3y)	2 gallbladder cardiac reflex, 4 postoperative hemorrhage, 3 pleural effusions
Feng ⁶¹	RCT	China	HCC	3	RES	84(116)	75/9	47 (18-76)	2.6±0.8	0.62(3y)	NA	0.62(3y)	7 pleural effusion, 3 pneumonia, 1 effusion plus infection, 3 wound infection or dehiscence, 1 biliary fistula, 2 abdominal bleeding, 1 pneumothorax or hemothorax
					RFA	84(120)	79/5	51 (24-83)	2.4±0.6	0.55(3y)	NA	0.55(3y)	5 pleural effusion, 1 liver abscess, 2 abdominal bleeding
Peng ⁶²	Retrospect ive cohort	China	Recurrent HCC	4.9	RES	74	65/9	51.5±12.1 (24-75)	1.1±0.5 (0.8-2.0)	0.62	NA	0.62	1 liver failure, 2 gastrointestinal bleeding, 1 peritoneal bleeding, 1 intestinal obstruction, 1 spontaneous bacterial peritonitis, 1 persistent jaundice, 31 ascites

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Peng ⁶³	RCT	China	Recurrent HCC	3.3±1.8	RFA	71	63/8	53.1±12.1 (28-74)	1.2±0.6 (0.9-2.0)	0.72	NA	0.72	1 gastrointestinal bleeding, 1 persistent jaundice, 12 ascites
Signoriello ⁶⁴	Retrospective cohort	Italy	HCC	0.1-9	RES	34(44)	30/4	62±7	≤3/3.1-5>5.1 (13/9/4)	NA	NA	0.29	NA
a. Wang ⁶⁵	Retrospective cohort	China	Early HCC	2.5	RES	52	38/14	≤60 (35)	NA	NA	NA	0.92	NA
b. Wang ⁶⁵	Retrospective cohort	China	Early HCC	2.5	RES	208	168/40	≤60 (113) (6/202)	≤2/2.1-5 (60/194)	NA	NA	0.77	NA
Desiderio ⁶⁶	Retrospective cohort	Italy	HCC	4.3(2.3-5)	RES	52(94)	37/15	65.6±4.8	≤3	0.46	NA	0.46	2 hepatic failure, 1 biliary fistula, 2 hemoperitoneum, 9 ascites

Study	Design	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
<u>Ding</u> 2013 ⁶⁷	Retrospective cohort	China	HCC	2.3±1.3	RFA	85(98)	68/17 (40-77)	58.64±8.52 (1.0-4.8)	2.38±0.81	0.82(3y) NA	NA	0.82(3y) 0.78(3y)	1 frequent premature ventricular contractions, 1 liver decompensation 1 breath holding and incomplete intestinal obstruction, 2 liver decompensation
<u>Guo</u> 2013 ⁶⁸	Retrospective cohort	China	HCC	2.7	RES	102(129)	94/8 (75/27)	51.5(18-75) (56-75)	≤3/3.1-5 ≤3/3.1-5 (62/32)	NA NA	NA NA	0.63 0.50	5 postoperative hemorrhage, 3 bile leak, 4 abscess, 3 infected ascites, 1 liver failure, 4 pleural effusion 1 postoperative hemorrhage, 2 bile leak, 1 abscess, 1 infected ascites, 3 pleural effusion
<u>Hasegawa</u> 2013 ⁶⁹	Retrospective cohort	Japan	HCC	2.2	RES	5361(646 1) 5548(741 2) 2059(283 6)	3967/139 4 3569/197 9 1303/756	66 (48-77) 69 (52-80) 69 (52-80)	2.3 (1.2-3) 2 (1-3) 1.7 (1-3)	0.71 0.61 0.56	NA NA NA	0.71 0.61 0.56	NA NA NA
<u>Iida</u> 2013 ⁷⁰	Retrospective cohort	Japan	HCC	0.1-7.5	Laparoscopic RFA	18(27)	NA	73.5±4.0	2.1±0.5	0.78	NA	0.78	1 abscess

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
					Laparoscopic MWA	40(56)		70.1±6.6	2.0±0.9	0.78	NA	0.78	1 abscess
<u>Imai</u> 2013 ⁷¹	Retrospective cohort	Japan	HCC	4.1	RES	101	75/26	63.3±9.7	2.14±0.55	0.87	NA	0.87	NA
					RFA	82	46/36	67.6±8.5	1.87±0.50	0.60	NA	0.60	NA
<u>Kim</u> 2013 ⁷²	Retrospective cohort	Korea	Early HCC	0.1-4.2	RES	47	36/11	58.8±10.7	3.66±0.76	NA	0.85(3y)	0.85(3y)	2 pleural effusion, 2 pneumonia, 1 hepatic failure, 1 hepatic abscess, 1 mechanical ileus
					TR	37	31/6	61.7±11.1	3.46±0.75	NA	0.78(3y)	0.78(3y)	1 bile duct dilatation
<u>Lai</u> 2013 ⁷³	Retrospective cohort	China	HCC	2.9±1.5	RES	80	55/25	60.8±9.9	2.9±1.1	0.71	NA	0.71	NA
					RFA	31	19/12	63.1±12.8	1.8±0.6	0.84	NA	0.84	NA
<u>Lin</u> 2013 ⁷⁴	Retrospective cohort	China	Early HCC	3.4	RFA	658	393/265	64.7±10.5 (0.8-9.5)	2.4±1.1	0.60	0.50	0.55	NA
					PEI	378	243/135	63.5±12.1 (0.4-7.0)	2.0±0.9	0.50	0.28	0.40	NA
<u>Peng</u> 2013 ⁷⁵	RCT	China	HCC	0.6-5.2	RFA	95(133)	71/24	55.3±13.3	3.39±1.35	NA	0.59(3y)	0.59(3y)	51 pain, 26 fever, 29 vomiting, 4 ascites, 2 pleural effusion, 1 skin burn, 1 abdominal infection, 1 small intestinal obstruction
					TR	94(137)	75/19	53.3±11	3.47±1.44	NA	0.67(3y)	0.67(3y)	57 pain, 33 fever, 40 vomiting, 5 ascites, 3 pleural effusion, 1 skin burn, 1 bile duct stenosis, 1 gastric hemorrhage

Study Year	Design style	Country '	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
<u>Tohme</u> ⁷⁶	Retrospect ive cohort	Ameri ca	Early HCC	2.4	RES	50(62)	31/19	66.3±1	3.07±1.17	0.48	NA	0.48	3 pleural effusion, 1 pneumonia, 1 myocardial infarction, 2 biloma, 2 ileus, 1 ascites, 1 hyperbilirubinaemia >6, 1 renal insufficiency, 2 encephalopathy
<u>Wong</u> ⁷⁷	Retrospect ive cohort	China	Early HCC	0.1-5	RES	46	30/16	55.1±12	2.1±0.6	0.85	NA	0.85	2 fever, 1 increased serum alanine aminotransferase level, 2 atelectasis, 2 biloma
<u>Zhang</u> ⁷⁸	Retrospect ive cohort	China	HCC	2.2±1	RFA	78(97)	64/14 (30-80)	54±10.5 (47/31)	≤3/3.1-5	0.43	0.39	0.41	1 persistent jaundice, 1 biliary fistula
<u>Abdelaziz</u> ⁷⁹	RCT	Egypt	Early HCC	2.3	RFA	45(52)	31/14	56.8±7.3	2.95±1.03	0.68(1y)	NA	0.68(1y)	2 subcapsular hematoma, 1 thigh burn, 2 pleural effusion
<u>Shi</u> ⁸⁰	Retrospect ive cohort	China	HCC	3.8	RES	107(126)	87/20	54.5±9.9 (37/54)	≤3/3.1-5	0.73	0.57	0.60	NA

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Yang ⁸¹ 2014	Retrospective cohort	Korea	HCC	0.1-7	RES	52	38/14	55.7±10.6	≤3/3.1-5 (40/56)	0.65	0.52	0.52	NA
Zhang ⁸² 2014	Retrospective cohort	China	Recurrent HCC	2.7	RES	27(29)	25/2	47±13	3.2±1.0	NA	NA	0.63	NA
Pompili ⁸³ 2015	Retrospective cohort	Italy	Early HCC	2.8	RFA	136	75/61	68 (41-85)	1.8 (1-2)	0.63	NA	0.63	2 ascites, 1 pleural effusion, 1 hemobilia
Xu ⁸⁴ 2015	RCT	China	HCC	0.1-3	Laparoscopic RES	45	34/11	58.3±3.1 (26-78)	3.6±0.7 (1-5)	NA	0.38(3y)	0.38(3y)	3 bile leakage, 3 pleural effusion, 2 postoperative hemorrhage
					MWA	45	32/13	57.9±3.4 (27-76)	3.8±0.9 (2-5)	NA	0.33(3y)	0.33(3y)	1 bile leakage, 1 pleural effusion, 1 postoperative hemorrhage

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Agcaoglu O 2013 ⁹⁶	Prospectiv e cohort	Ameri ca	HCC	1.7	RES	94	50/44	61.7±1.2	3.7±0.2	NA	0.53	0.53	2 pulmonary,2 biliary,2 wound-related,1 intestinal,1 hemorrhagic,2 cardiac , and 1 renal 3 bleeding,2 liver abscess,5 pulmonary,3 renal
Zhou Z 2014 ⁹³	Retrospect ive cohort	China	HCC	5	RES	21	15/6	42.2±7.6	1.7±0.3	0.81	NA	0.81	1 intraperitoneal hemorrhage
Kim JM 2014 ⁹⁵	Retrospect ive cohort	Korea	HCC	2.8	RES	66	48/18	58.	2.1(0.8-3.0)	0.89	NA	0.89	NA
Ko S 94	Retrospect ive cohort	China	HCC	5	RES	12	9/3	71.6±4.3	2.9±1.4	NA	NA	0.67	NA
Kang TW 2015 ⁹²	Retrospect ive cohort	Korea	HCC	5	RES	142	107/35	53(28-74)	2(1.1-3.0)	0.90	NA	0.90	1 intra-abdominal abscess,3 wound problem,1 abdominal bleeding,1 intestinal obstruction

Study Year	Design style	Country	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female	Age	Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Lee YH 2015 ⁹¹	Retrospect ive cohort	China	HCC	3.63	RES	330	261/69	61±12	<5	NA	NA	0.76	NA
Liu PH 2016 ⁸⁷	Prospectiv e cohort	China	HCC	3.7	RES	109	78/31	60±13	<2	NA	0.81	0.81	NA
Hof J 2016 ⁸⁹	Retrospect ive cohort	Nethe rlands	HCC	3.2	RES	261	151/110	63.4	<5	0.69	NA	0.69	NA
Lee HW 2018 ⁸⁵	RCT	Korea	HCC	5	RES	29	23/6	55.6±7.9	<5	NA	0.97(3y)	0.97(3y)	7 pleural effusion
					RFA	34	24/10	56.1±7.4	<5	NA	0.97(3y)	0.97(3y)	3 pain

Study Year	Design style	Country '	Disease type	Follow-up (year)	Treatment style	Group n (Tumor n)	Male/ Female		Tumor size, cm	5-year Survival rates (unless stated)			Complication
										<3cm	3-5cm	All	
Li W 86	Retrospect ive cohort	China	HCC	5	RES	220(239)	37/183	61.8 (40-73)	2.1±0.5	0.75	NA	0.75	64 complications
Vogl TJ 2015 ⁹⁰	Retrospect ive cohort	Germ any	HCC	5	RFA	25(32)	19/6	57±3.5	3.2(0.8-4.5)	0.72(3y)	NA	0.72(3y)	NA
Liu H 88	RCT	China	HCC	4.7	TR	100(114)	86/14	52(31-80)	2.8(0.6-5)	0.67	NA	0.67	8 pleural effusion,5 biliary fstula,4 abdominal ascites,2 liver dysfunction,2 pneumonia,1 wound infection,1 abdominal infection
					RES	100(109)	94/6	49(30-76)	3(0.6-5)	0.84	NA	0.84	4 pleural effusion,3 liver dysfunction,3 abdominal ascites,1 abdominal bleeding

HCC: hepatocellular carcinoma;

BCLC: Barcelona Clinic Liver Cancer;

RES: resection;

RFA: radiofrequency ablation;

MWA: microwave ablation;

TR: transcatheter arterial chemoembolization and radiofrequency ablation;

PEI: percutaneous ethanol injection;

RCT: randomized controlled trial;

NA: not available.

Table S2.
Quality assessment of included studies using GRADE framework.

Intervention/Comparator	Illustrative comparative risks* (per 1000, 95% CI)		Relative effect of survival time (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)
	Comparator Assumed survival risk	Corresponding survival risk with intervention			
1-year OS rate					
RES/MWA	923	984 (932 to 997)	OR 5.25 (1.15 to 23.97)	290 (2 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/MWA	947	944 (902 to 968)	OR 0.94 (0.52 to 1.71)	990 (6 studies)	⊕ ⊕ ⊖ ⊖ low
RES/PEI	835	802 (674 to 889)	OR 0.80 (0.41 to 1.58)	519 (3 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/PEI	944	963 (906 to 1000)	OR 1.02 (0.96 to 1.09)	9187 (4 studies)	⊕ ⊕ ⊖ ⊖ low
RES/RFA	932	945 (931 to 956)	OR 1.25 (0.99 to 1.60)	5006 (30 studies)	⊕ ⊕ ⊕ ⊕ high
RES/TR	939	904 (765 to 965)	OR 0.61 (0.21 to 1.79)	201 (2 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/TR	938	802 (310 to 978)	OR 0.27 (0.03 to 2.90)	31 (1 study)	⊕ ⊕ ⊖ ⊖ low
3-year OS rate					

RES/MWA	712	734 (623 to 822)	OR 1.12 (0.67 to 1.87)	290 (2 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/MWA	736	779 (717 to 828)	OR 1.26 (0.91 to 1.73)	987 (6 studies)	⊕ ⊕ ⊖ ⊖ low
RES/PEI	499	536 (421 to 645)	OR 1.16 (0.73 to 1.83)	519 (3 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/PEI	729	748 (657 to 822)	OR 1.10 (0.71 to 1.71)	9187 (4 studies)	⊕ ⊕ ⊖ ⊖ low
RES/RFA	785	851 (823 to 875)	OR 1.57 (1.28 to 1.93)	15906 (30 studies)	⊕ ⊕ ⊕ ⊖ moderate
RES/TR	798	760 (618 to 860)	OR 0.80 (0.41 to 1.55)	201 (2 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/TR	737	611 (516 to 704)	OR 0.56 (0.38 to 0.85)	454 (4 studies)	⊕ ⊕ ⊕ ⊖ moderate
5-year OS rate					
RES/MWA	545	607 (492 to 712)	OR 1.29 (0.81 to 2.07)	290 (2 studies)	⊕ ⊕ ⊖ ⊖ low
RFA/MWA	545	609 (442 to 756)	OR 1.30 (0.66 to 2.58)	687 (4 studies)	⊕ ⊕ ⊖ ⊖ low
RES/PEI	293	436 (334 to 545)	OR 1.87 (1.21 to 2.90)	519 (3 studies)	⊕ ⊕ ⊕ ⊖ moderate
RFA/PEI	533	496 (368 to 624)	OR 0.86 (0.51 to 1.45)	9187 (4 studies)	⊕ ⊕ ⊖ ⊖ low
RES/RFA	601	744 (705 to 779)	OR 1.93 (1.59 to 2.34)	15154 (25 studies)	⊕ ⊕ ⊕ ⊖ moderate

RES/TR	290	419 (251 to 607)	OR 1.76 (0.82 to 3.78)	117 (1 study)	⊕ ⊕ ⊖ ⊖ low
RFA/TR	464	356 (222 to 523)	OR 0.64 (0.33 to 1.27)	139 (1 study)	⊕ ⊕ ⊕ ⊖ moderate

The absolute and relative risk of survival with treatments*. GRADE: Grading of Recommendations, Assessment, Development and Evaluation. *The results presented in the Table S1 were built around the assumption of a consistent relative effect. The implications of this effect for populations were considered at different baseline risks. Based on the assumed risks, corresponding risks after an intervention were calculated using the meta-analytic risk ratio.

Table S3.
Ranking treatments of 1-, 3-year and 5-year survival rate of the lesions < 3 cm, 3-5 cm and ≤ 5 cm in RCT.

Treatment	1-year			3-year			5-year		
	Study numbers (n)	Rank	Meanrank	Study numbers (n)	Rank	Meanrank	Study numbers (n)	Rank	Meanrank
< 3cm	13			11			5		
RES		2	2.86		1	1.52		1	1.42
RFA		3	3.13		3	2.58		2	2.46
MWA		1	1.04		NA	NA		NA	NA
TR		4	3.59		2	2.35		3	2.89
PEI		5	4.43		4	3.55		4	3.23
3-5cm	4			4			2		
RES		1	1.17		1	1.19		1	1.69
RFA		3	2.88		3	2.91		3	2.60
MWA		NA	NA		NA	NA		NA	NA
TR		2	1.94		2	1.90		2	1.71
PEI		NA	NA		NA	NA		NA	NA
All tumours (≤	20			16			7		

5cm)								
RES	3	2.53		1	1.85		1	1.62
RFA	4	3.94		4	3.62		3	2.87
MWA	1	1.67		3	2.88		NA	NA
TR	2	1.93		2	2.38		2	1.78
PEI	5	4.92		5	4.27		4	3.73

RES: resection;

RFA: radiofrequency ablation;

MWA: microwave ablation;

TR: transcatheter arterial chemoembolization and radiofrequency ablation;

PEI: percutaneous ethanol injection.

Table S4.

Ranking treatments of 1-, 3-year and 5-year survival rate of the lesions < 3 cm, 3-5 cm and ≤ 5 cm in all studies.

Treatment	1-year			3-year			5-year		
	Study numbers (n)	Rank	Meanrank	Study numbers (n)	Rank	Meanrank	Study numbers (n)	Rank	Meanrank
< 3cm	50			48			37		
RES		3	1.18		1	1.71		1	1.16
RFA		4	3.17		3	3.38		2	3.02
MWA		1	1.91		4	3.42		3	3.11
TR		2	2.63		2	2.73		4	3.61
PEI		5	4.62		5	3.76		5	4.11
3-5cm	19			18			12		
RES		1	1.12		1	1.04		1	1.93
RFA		4	3.54		4	3.58		3	3.18
MWA		3	3.45		3	3.50		4	3.43
TR		2	2.05		2	2.14		2	1.94
PEI		5	4.84		5	4.74		5	4.53

All tumours (\leq 5cm)	72		68		50	
RES	2	2.07	1	1.50	1	1.11
RFA	3	3.48	3	3.68	4	3.34
MWA	4	3.57	4	3.84	3	3.23
TR	1	1.19	2	1.82	2	3.05
PEI	5	4.70	5	4.16	5	4.28

RES: resection;

RFA: radiofrequency ablation;

MWA: microwave ablation;

TR: transcatheter arterial chemoembolization and radiofrequency ablation;

PEI: percutaneous ethanol injection.

Table S5.

Survival rates (1-year, 3-year and 5-year) for small lesion (<3cm) treatment comparisons estimated by direct and network meta-analysis in RCT.

Intervention	OR (95%CI)	Pairwise Meta-analysis
	Network Meta-analysis	
1-year OS rate for treatment vs reference		
RFA vs RES	0.97 (0.42-1.98)	0.98 (0.77-1.26)
MWA vs RES	152 (1.44-505.80)	NA
TR vs RES	1.08 (0.15-3.78)	0.99(0.67-1.47)
PEI vs RES	0.64 (0.18-1.61)	1.03 (0.54-1.94)
MWA vs RFA	173.30 (1.90-537.40)	1.42 (0.63-3.19)
TR vs RFA	1.25 (0.16-4.64)	1.00 (0.56-1.80)
PEI vs RFA	0.67 (0.28-1.35)	0.97 (0.78-1.19)
TR vs MWA	0.15 (0-0.80)	NA
PEI vs MWA	0.08 (0-0.38)	NA
PEI vs TR	1.17 (0.11-4.66)	NA
3-year OS rate for treatment vs reference		

RFA vs RES	0.75 (0.41-1.31)	0.92 (0.71-1.19)
MWA vs RES	NA	NA
TR vs RES	1.17 (0.16-4.17)	0.80(0.52-1.22)
PEI vs RES	0.58 (0.29-1.16)	1.21 (0.59-2.15)
MWA vs RFA	NA	NA
TR vs RFA	1.54 (0.25-13.43)	1.01 (0.55-1.87)
PEI vs RFA	0.79 (0.45-1.39)	0.91 (0.71-1.17)
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	1.02 (0.14-3.56)	NA
5-year OS rate for treatment vs reference		
RFA vs RES	0.72 (0.10-2.47)	0.93 (0.62-1.37)
MWA vs RES	NA	NA
TR vs RES	0.84 (0.03-4.18)	0.88(0.69-1.12)
PEI vs RES	0.50 (0.04-2.04)	0.55 (0.26-1.15)
MWA vs RFA	NA	NA
TR vs RFA	2.87 (0.04-13.43)	NA
PEI vs RFA	0.94 (0.08-3.97)	0.97 (0.66-1.40)
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	3.93 (0.03-19.61)	NA

Table S6.

Survival rates (1-year, 3-year and 5-year) for lesion (3-5cm) treatment comparisons estimated by direct and network meta-analysis in RCT.

Intervention	OR (95%CI)	
	Network Meta-analysis	Pairwise Meta-analysis
1-year OS rate for treatment vs reference		
RFA vs RES	0.25 (0-1.47)	0.89 (0.45-1.77)
MWA vs RES	NA	NA

TR vs RES	1.00 (0-5.0)	NA
PEI vs RES	NA	NA
MWA vs RFA	NA	NA
TR vs RFA	3.40 (0.64-11.93)	1.10 (0.78-1.55)
PEI vs RFA	NA	NA
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	NA	NA
3-year OS rate for treatment vs reference		
RFA vs RES	0.24 (0-1.25)	0.70 (0.34-1.45)
MWA vs RES	NA	NA
TR vs RES	1.14 (0-6.20)	NA
PEI vs RES	NA	NA
MWA vs RFA	NA	NA
TR vs RFA	3.98 (0.71-15.22)	1.29 (0.87-1.89)
PEI vs RFA	NA	NA
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	NA	NA
5-year OS rate for treatment vs reference		
RFA vs RES	1.05 (0.03-5.33)	0.71 (0.32-1.57)
MWA vs RES	NA	NA
TR vs RES	12.87 (0.02-44.43)	NA
PEI vs RES	NA	NA
MWA vs RFA	NA	NA
TR vs RFA	7.64 (0.14-42.49)	1.93 (0.53-7.06)
PEI vs RFA	NA	NA
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	NA	NA

Table S7.

Survival rates (1-year, 3-year and 5-year) for lesion ($\leqslant 5\text{cm}$) treatment comparisons estimated by direct and network meta-analysis in RCT.

Intervention	OR (95%CI)	Pairwise Meta-analysis
	Network Meta-analysis	
1-year OS rate for treatment vs reference		
RFA vs RES	0.57 (0.27-1.08)	0.96 (0.78-1.19)
MWA vs RES	2.01 (0.47-5.70)	0.98 (0.54-1.78)
TR vs RES	1.50 (0.48-3.67)	0.99 (0.67-1.47)
PEI vs RES	0.37 (0.13-0.82)	1.03 (0.54-1.94)
MWA vs RFA	3.84 (0.81-11.60)	1.42 (0.63-3.19)
TR vs RFA	2.69 (1.02-6.04)	1.09 (0.84-1.43)
PEI vs RFA	0.65 (0.33-1.13)	0.95 (0.80-1.14)
TR vs MWA	1.09 (0.16-3.50)	NA
PEI vs MWA	0.27 (0.05-0.84)	NA
PEI vs TR	0.29 (0.09-0.73)	NA
3-year OS rate for treatment vs reference		
RFA vs RES	0.65 (0.31-1.29)	0.88 (0.71-1.10)
MWA vs RES	1.00 (0.16-3.30)	0.88 (0.39-1.98)
TR vs RES	0.98 (0.35-2.41)	0.80 (0.51-1.22)
PEI vs RES	0.55 (0.19-1.44)	1.12 (0.59-2.15)
MWA vs RFA	1.77 (0.22-6.24)	NA
TR vs RFA	1.56 (0.66-3.25)	1.20 (0.90-1.60)
PEI vs RFA	0.86 (0.39-1.79)	0.84 (0.66-1.07)
TR vs MWA	1.86 (0.21-7.59)	NA
PEI vs MWA	1.05 (0.12-4.56)	NA
PEI vs TR	0.64 (0.19-1.67)	NA
5-year OS rate for treatment vs reference		
RFA vs RES	0.66 (0.20-1.62)	0.88 (0.65-1.18)
MWA vs RES	NA	NA

TR vs RES	1.35 (0.23-4.69)	0.80 (0.52-1.22)
PEI vs RES	0.41 (0.11-1.02)	0.55 (0.26-1.15)
MWA vs RFA	NA	NA
TR vs RFA	2.29 (0.41-7.61)	1.30 (0.70-2.41)
PEI vs RFA	0.74 (0.16-2.00)	0.97 (0.66-1.40)
TR vs MWA	NA	NA
PEI vs MWA	NA	NA
PEI vs TR	0.53 (0.06-1.90)	NA

OR: odds ratio;

RES: resection;

RFA: radiofrequency ablation;

MWA: microwave ablation;

TR: transcatheter arterial chemoembolization and radiofrequency ablation;

PEI: percutaneous ethanol injection;

NA: not available.

Table S8.

Survival rates (1-year, 3-year and 5-year) for small lesion (<3cm) treatment comparisons estimated by direct and network meta-analysis in all studies.

Intervention	OR (95%CI)	Network Meta-regression	Pairwise Meta-analysis
1-year OS rate for treatment vs reference			
RFA vs RES	0.94 (0.39-1.91)		1.00(0.95-1.04)
MWA vs RES	1.49 (0.44-3.85)		1.02(0.72-1.43)
TR vs RES	1.30 (0.28-3.88)		1.01(0.74-1.39)
PEI vs RES	0.63 (0.22-1.44)		1.00 (0.93-1.07)
MWA vs RFA	1.59 (0.69-3.17)		1.02 (0.85-1.23)
TR vs RFA	1.48 (0.34-4.23)		1.00(0.56-1.80)
PEI vs RFA	0.68 (0.38-1.09)		0.99 (0.93-1.06)

TR vs MWA	1.08 (0.21-7.87)	NA
PEI vs MWA	0.49 (0.18-1.10)	NA
PEI vs TR	0.69 (0.14-2.13)	NA
3-year OS rate for treatment vs reference		
RFA vs RES	0.72 (0.37-1.30)	0.94 (0.90-0.99)
MWA vs RES	0.73 (0.30-1.55)	0.95 (0.78-1.18)
TR vs RES	0.90 (0.31-2.10)	1.08 (0.64-1.33)
PEI vs RES	0.68 (0.30-1.39)	1.00 (0.71-1.40)
MWA vs RFA	1.02 (0.57-1.70)	1.00 (0.82-1.22)
TR vs RFA	1.31 (0.47-2.92)	1.01 (0.55-1.87)
PEI vs RFA	0.96 (0.59-1.50)	0.97 (0.90-1.03)
TR vs MWA	1.38 (0.42-3.40)	NA
PEI vs MWA	1.01 (0.47-1.95)	NA
PEI vs TR	0.90 (0.29-2.17)	NA
5-year OS rate for treatment vs reference		
RFA vs RES	0.54 (0.24-1.05)	0.85 (0.81-0.90)
MWA vs RES	0.55 (0.19-1.25)	0.88 (0.61-1.30)
TR vs RES	0.49 (0.16-0.18)	0.77 (0.53-1.11)
PEI vs RES	0.43 (0.17-0.89)	0.79 (0.73-0.85)
MWA vs RFA	1.04 (0.50-1.77)	1.02 (0.78-1.33)
TR vs RFA	0.99 (0.32-2.39)	NA
PEI vs RFA	0.82 (0.48-1.29)	0.92 (0.85-0.99)
TR vs MWA	1.03 (0.28-2.73)	NA
PEI vs MWA	0.86 (0.39-1.65)	NA
PEI vs TR	1.07 (0.31-2.72)	NA

Table S9.

Survival rates (1-year, 3-year and 5-year) for lesion (3-5cm) treatment comparisons estimated by direct and network meta-analysis in all studies.

Intervention	OR (95%CI)
	35

	Network Meta-regression	Pairwise Meta-analysis
1-year OS rate for treatment vs reference		
RFA vs RES	0.12 (0-0.63)	0.96 (0.81-1.14)
MWA vs RES	0.15 (0-1.00)	NA
TR vs RES	0.36 (0.01-2.08)	1.02 (0.55-1.88)
PEI vs RES	0.06 (0-0.31)	NA
MWA vs RFA	1.29 (0.32-3.60)	0.99 (0.60-1.64)
TR vs RFA	2.99 (1.14-6.58)	1.11 (0.80-1.54)
PEI vs RFA	0.49 (0.18-1.12)	0.89 (0.66-1.20)
TR vs MWA	3.39 (0.58-10.44)	NA
PEI vs MWA	0.55 (0.09-1.76)	NA
PEI vs TR	0.20 (0.05-0.54)	NA
3-year OS rate for treatment vs reference		
RFA vs RES	0.11 (0.01-0.40)	0.72 (0.60-0.88)
MWA vs RES	0.12 (0.01-0.53)	1.02 (0.57-1.81)
TR vs RES	0.26 (0.01-1.10)	0.92 (0.48-1.75)
PEI vs RES	0.06 (0-0.28)	NA
MWA vs RFA	1.15 (0.39-2.65)	0.81 (0.45-1.43)
TR vs RFA	2.38 (0.93-5.38)	1.29 (0.87-1.89)
PEI vs RFA	0.55 (0.12-1.69)	0.71 (0.50-1.00)
TR vs MWA	2.62 (0.61-7.90)	NA
PEI vs MWA	0.61 (0.08-2.26)	NA
PEI vs TR	0.28 (0.04-0.96)	NA
5-year OS rate for treatment vs reference		
RFA vs RES	0.69 (0.04-3.16)	0.53 (0.40-0.68)
MWA vs RES	1.24 (0.02-4.46)	0.90 (0.48-1.69)
TR vs RES	14.31 (0.04-21.06)	NA
PEI vs RES	3.02 (0.01-2.40)	NA
MWA vs RFA	1.26 (0.19-4.04)	0.57 (0.21-1.51)
TR vs RFA	6.16 (0.27-25.58)	2.36 (0.66-8.37)
PEI vs RFA	0.86 (0.06-2.68)	0.56 (0.37-0.84)

TR vs MWA	11.97 (0.19-46.76)	NA
PEI vs MWA	4.15 (0.04-5.18)	NA
PEI vs TR	5.77 (0.01-2.84)	NA

Table S10.

Survival rates (1-year, 3-year and 5-year) for lesion ($\leq 5\text{cm}$) treatment comparisons estimated by direct, indirect and network meta-analysis in all studies.

Intervention	OR (95%CI)	Pairwise Meta-analysis
	Network Meta-regression	
1-year OS rate for treatment vs reference		
RFA vs RES	0.68 (0.35-1.17)	0.99 (0.95-1.04)
MWA vs RES	0.70 (0.29-1.39)	0.97 (0.77-1.23)
TR vs RES	1.72 (0.66-3.70)	1.01 (0.76-1.33)
PEI vs RES	0.52 (0.24-0.96)	1.01 (0.74-1.39)
MWA vs RFA	1.04 (0.55-1.76)	1.01 (0.85-1.20)
TR vs RFA	2.55 (1.20-4.85)	1.10 (0.85-1.43)
PEI vs RFA	0.77 (0.51-1.10)	0.98 (0.93-1.05)
TR vs MWA	2.69 (0.99-6.00)	0.91 (0.70-1.18)
PEI vs MWA	0.81 (0.38-1.51)	NA
PEI vs TR	0.34 (0.11-0.63)	NA
3-year OS rate for treatment vs reference		
RFA vs RES	0.63 (0.37-1.01)	0.96 (0.94-0.98)
MWA vs RES	0.62 (0.32-1.09)	0.94 (0.72-1.22)
TR vs RES	0.97 (0.48-1.79)	0.92(0.68-1.24)
PEI vs RES	0.59 (0.30-1.04)	0.93 (0.86-1.00)
MWA vs RFA	0.99 (0.64-1.47)	1.05 (0.86-1.26)
TR vs RFA	1.57 (0.89-2.57)	1.20 (0.90-1.60)
PEI vs RFA	0.94 (0.64-1.34)	0.95 (0.89-1.01)
TR vs MWA	1.65 (0.80-3.03)	NA
PEI vs MWA	0.98 (0.55-1.65)	NA

PEI vs TR	0.64 (0.32-1.16)	NA
5-year OS rate for treatment vs reference		
RFA vs RES	0.52 (0.29-0.88)	0.84 (0.80-0.88)
MWA vs RES	0.55 (0.25-1.05)	0.93(0.78-1.12)
TR vs RES	0.59 (0.25-1.20)	0.69 (0.34-1.42)
PEI vs RES	0.45 (0.23-0.82)	0.79 (0.73-0.85)
MWA vs RFA	1.06 (0.64-1.61)	0.97 (0.75-1.25)
TR vs RFA	1.16 (0.54-2.21)	1.30 (0.70-2.41)
PEI vs RFA	0.87 (0.57-1.26)	0.91 (0.84-0.98)
TR vs MWA	1.16(0.46-2.46)	NA
PEI vs MWA	0.87 (0.46-1.51)	NA
PEI vs TR	0.84 (0.35-1.74)	NA

OR: odds ratio;

RES: resection;

RFA: radiofrequency ablation;

MWA: microwave ablation;

TR: transcatheter arterial chemoembolization and radiofrequency ablation;

PEI: percutaneous ethanol injection;

NA: not available.

Table S11.

Posterior summaries from random effects consistency and inconsistency models for small lesion (<3cm) treatment in all studies.

Parameters	Network meta-regression (consistency model)			Inconsistency model		
	Mean	sd	CI	Mean	sd	CI
1-year OS rate for treatment vs reference						
σ	0.55	0.21	(0.15-1.00)	0.38	0.23	(0.02-0.88)
τ	12.40	65.04	(1.10-45.68)	109.40	620.40	(1.30-940.00)
resdev	90.04	13.04	(66.16-117.10)	94.65	12.94	(70.06-120.70)

pD	66.48			57.5		
DIC	453.18			404.59		
3-year OS rate for treatment vs reference						
σ	0.59	0.14	(0.34-0.88)	0.6	0.14	(0.36-0.91)
τ	3.26	1.62	(1.34-7.33)	3.28	1.90	(1.19-8.10)
resdev	92.02	14.19	(66.64-122.10)	90.7	13.92	(65.64-120.00)
pD	80.45			71.83		
DIC	589.01			517.44		
5-year OS rate for treatment vs reference						
σ	0.53	0.12	(0.32-0.80)	0.55	0.13	(0.34-0.84)
τ	4.06	2.02	(1.66-8.76)	3.80	2.05	(1.40-8.77)
resdev	63.99	11.47	(43.52-88.24)	63.55	11.37	(43.39-87.90)
pD	64.22			55.07		
DIC	488.23			412.10		

Table S12.

Posterior summaries from random effects consistency and inconsistency models for lesion (3-5cm) treatment in all studies.

Parameters	Network meta-regression (consistency model)			Inconsistency Model		
	Mean	sd	CI	Mean	sd	CI
1-year OS rate for treatment vs reference						
σ	0.28	0.25	(0.01-0.92)	0.38	0.34	(0.02-1.28)
τ	3108.00	68630.00	(1.44-4879.00)	19500.00	720600.00	(0.62-4178.00)
resdev	28.90	6.96	(17.25-44.41)	484.70	5117	(0.63-2616)
pD	24.70			24.62		
DIC	166.90			157.30		
3-year OS rate for treatment vs reference						
σ	0.62	0.27	(0.17-1.24)	0.67	0.31	(0.14-1.40)
τ	5.34	12.61	(0.83-21.20)	41.87	585.80	(0.52-77.13)
resdev	32.36	8.17	(18.39-50.07)	32.62	8.22	(18.52-50.51)

pD	30.91		28.63			
DIC	212.30		188.69			
5-year OS rate for treatment vs reference						
σ	0.80	0.46	(0.14-1.94)	0.60	0.42	(0.04-1.64)
τ	337.00	11980	(0.30-20.22)	10100.00	258400.00	(0.37-691.30)
resdev	22.54	6.73	(11.29-37.43)	22.57	6.519	(11.45-36.90)
pD	22.61		19.88			
DIC	146.84		131.53			

Table S13.
Posterior summaries from random effects consistency and inconsistency models for lesion ($\leq 5\text{cm}$) treatment in all studies.

Parameters	Network meta-regression (consistency model)			Inconsistency Model		
	Mean	sd	CI	Mean	sd	CI
1-year OS rate for treatment vs reference						
σ	0.49	0.13	(0.26-0.77)	0.29	0.14	(0.05-0.58)
τ	6.00	6.24	(1.92-16.85)	116.80	1122.00	(2.96-419.40)
resdev	129.2	14.99	(101.40-160)	133.1	14.50	(105.70-162.80)
pD	95.71		78.20			
DIC	692.39		604.18			
3-year OS rate for treatment vs reference						
σ	0.50	0.09	(0.33-0.70)	0.47	0.096	(0.29-0.67)
τ	4.20	1.45	(2.15-7.71)	5.31	2.59	(2.24-11.80)
resdev	124	15.64	(95.16-156.40)	124.5	15.89	(95.35-157.50)
pD	111.54		93.41			
DIC	856.01		723.74			
5-year OS rate for treatment vs reference						
σ	0.44	0.10	(0.26-0.65)	0.44	0.1	(0.26-0.67)
τ	5.30	2.27	(2.38-14.90)	6.09	3.95	(2.29-14.87)

resdev	86.73	13.53	(62.35-115.40)	85.74	13.55	(61.39-114.40)
pD	84.53			68.81		
DIC	670.73			544.40		

sd: standard deviation;

CI: Credible Interval

σ : between-trial standard deviation

τ^2 : between-trial variance

resdev: residual deviance

pD: effective number of parameters

DIC: deviance information criterion

Figure S1.

Results of the consistency test for closed loop at 1-year, 3-year, and 5-year survival rate of the lesions < 3 cm, 3-5 cm and \leq 5 cm.

- i Results of the consistency test for closed loop at 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions < 3 cm

- ii Results of the consistency test for closed loop at 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions 3-5 cm
- iii Results of the consistency test for closed loop at 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions ≤ 5 cm

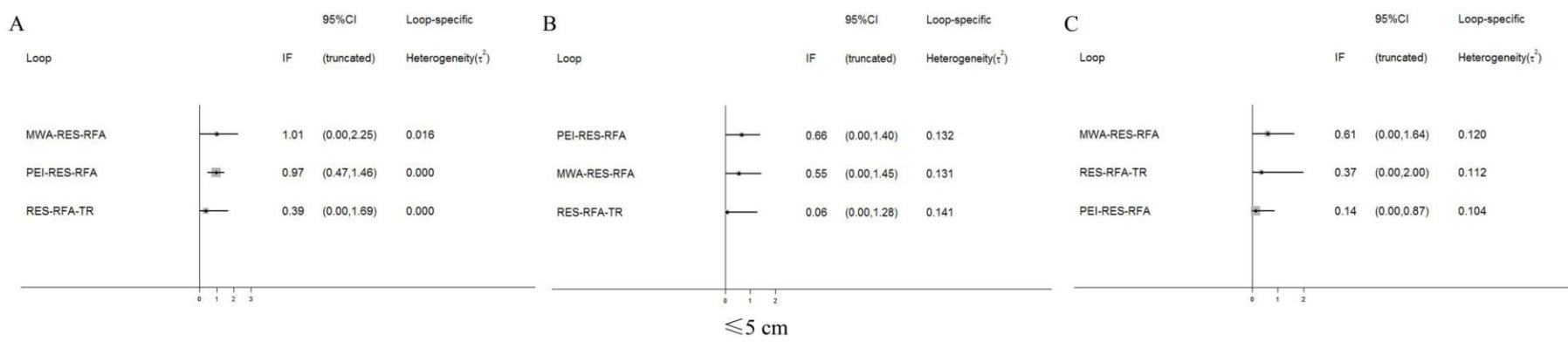
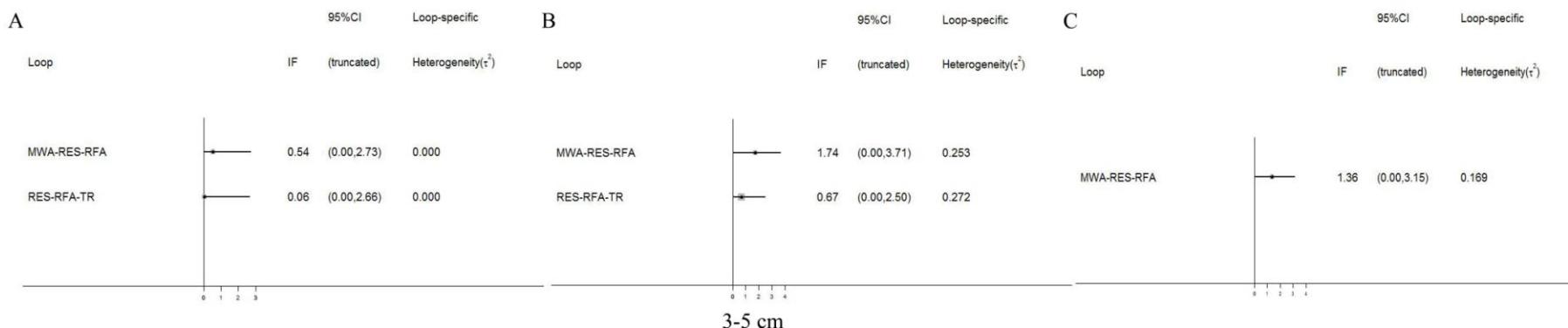
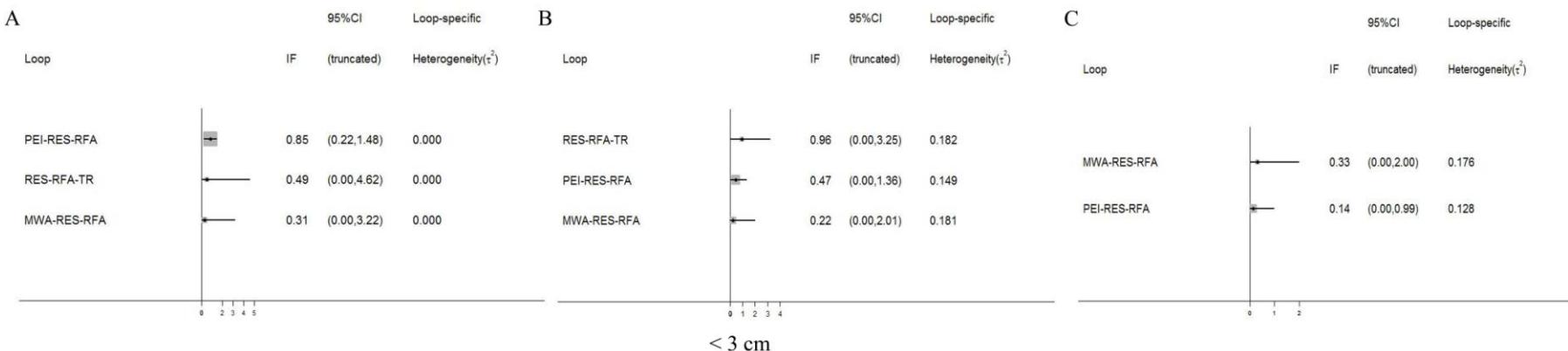
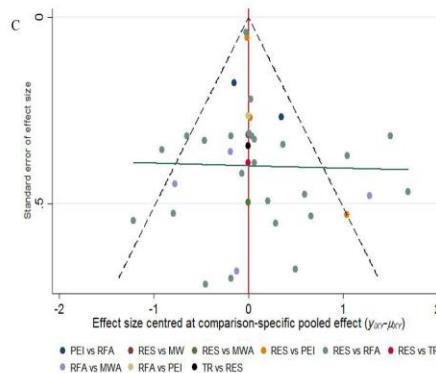
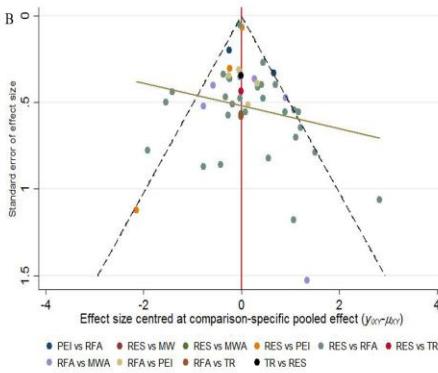
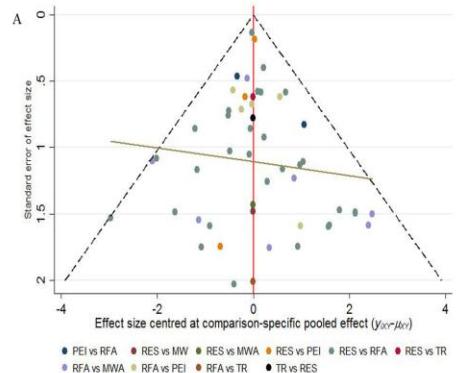


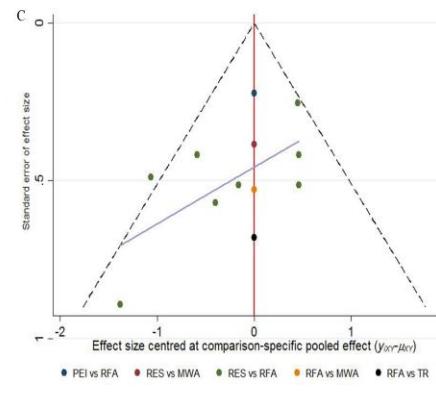
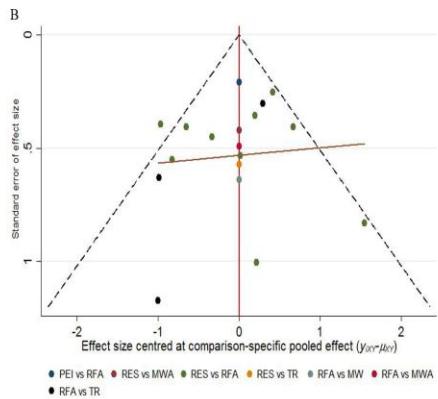
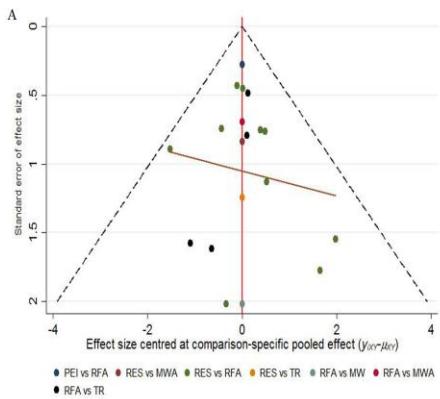
Figure S2.

Assessment of publication bias using funnel plot.

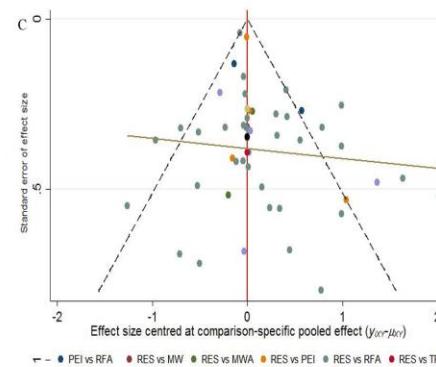
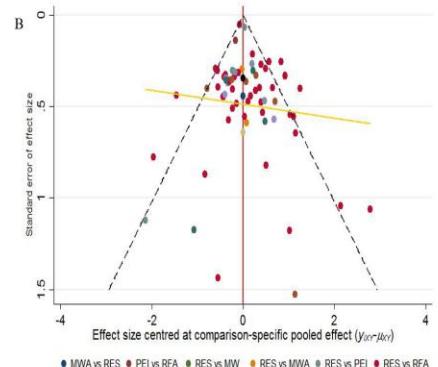
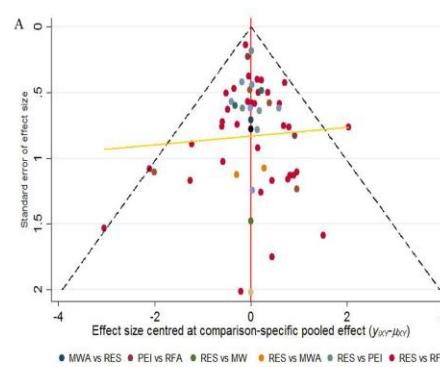
- i Assessment of publication bias using funnel plot for 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions < 3 cm.
- ii Assessment of publication bias using funnel plot for 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions 3-5 cm.
- iii Assessment of publication bias using funnel plot for 1-year (A), 3-year (B), and 5-year (C) survival rate of the lesions ≤ 5 cm



i <3cm



ii 3-5cm



iii <5cm

